Advanced Distributed Learning

By

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The future of Naval aviation training is directly linked to our success in converting and/or augmenting conventional classroom instructor training with advanced distributed learning (ADL). The foreign military sales (FMS) customer should develop familiarity with the concepts and protocols of ADL since it will be in this medium that much of future computer based training will be developed. To achieve the ADL training vision, training must be distributed just-in-time and on demand, be available anytime-anywhere, and be enabled with resource development and exploitation of modern learning technologies. ADL is a strategy developed to harness the power of learning, information, and communication technologies to modernize education and training. The ADL initiative is intended to implement the "anytime-anywhere" learning concept to provide access to the highest quality education and training that can be tailored to individual needs and delivered cost-effectively, whenever and wherever it is required. This concept will apply equally to both NAVAIR and FMS customers.

This article describes an approach to technical training which is still in development, but which holds potential for improving the efficiency and effectiveness of training provided to the Navy's international customers. Important cost-sharing, communications security and technical transfer issues concerning the application of ADL to FMS customers have not been resolved. This is also true for other information technology-enabled initiatives such as web access to technical manuals. The purpose of the article is merely to familiarize our potential customers with ADL and to stimulate a productive dialogue with the customers in these early stages of the Navy's program.

For newcomers to the concept of ADL, the following definitions should ensure that we have a common understanding of ADL and its associated terminology:

- Distributed (also referred to as distance) learning is structured learning that takes place without the physical presence of the instructor. Distributed learning is enhanced with technology. It may draw upon resources which are physically distant from the location where learning is taking place and may include the use of one or more of the following media; correspondence course materials, audio/videotapes, Compact Disc-Read Only Memory (CD-ROMs), audio/video tele-training, interactive television, and video conferencing to provide right-time and right-place learning.

- Computer-Managed Instruction (CMI) is an environment that supports the needs of developers, learners, instructors, administrators, and managers. ADL encompasses all the methodologies mentioned above, and in addition, includes ongoing and expected improvements in learning methodologies.

- Learning technology standards now use the term learning management system instead of CMI so as to include new functionalities and capabilities that have not historically been associated with CMI systems such as back-end connections to other information systems,

complex tracking and reporting, centralized registration, on-line collaboration and adaptive content delivery.

• Advanced the next generation of more powerful and cost-effective learning technologies: technologies built on common standards that would allow us to reuse software and deliver information over a network.

• Distributed provides a flow of information between instructors, students, developers, and administrators. It also allows us to collect information about job and system performance.

• Learning in the broadest sense this encompasses education, training, and on-the-job performance aiding. Learning is the outcome of these activities.

The ADL strategy is to:

- Exploit existing internet-based technologies.
- Create reusable content to lower development costs.
- Promote widespread collaboration to satisfy common needs.
- Enhance performance with next-generation learning technologies.
- Develop a common framework that drives the commercial off-the-shelf product cycle.
- Establish a coordinated implementation process.

In today's dynamic threat environment, an FMS customer's forces may have to deploy on a moment's notice, often to conduct operations that cannot be adequately predicted and for which they have not planned or practiced. Future forces must be highly adaptive, learning forces that organize to meet threats effectively and rapidly. They must continuously learn, simulate, and rehearse, whether they are in school, at home stations, at home, en route to, or in the theater of operations. The armed forces of the future must be able to fight in joint, combined, and interagency environments enabled by information superiority. Training products developed to implement the advanced distributed learning initiative (ADLI) use modern communication technology to deliver high-quality training to service members.

For FMS customers who are remotely located from classroom, instructional methods need to become more portable and flexible. Due to decreases in the number of available instructors and requirements to reduce FMS costs, a new approach to training is required that will provide a means of meeting mission readiness requirements. An additional benefit of this new approach to instruction is the offset of strains caused by increased operational tempo and personnel reductions throughout the armed forces. ADL does not exclude any existing delivery method; however, it may expand and complement legacy delivery systems. The emergent reduced manning policy for military field units has compelled the increased use of technology and increased the work hours of personnel to the point of duty saturation. The introduction of ADL technology will require personnel to budget additional time in their work schedules to meet their personal training objectives. Therefore, manpower, personnel, and training analysis for new acquisitions must include training time in the computation of the standard military work week.

The accelerating pace of technological change in weapons systems and the ever-growing complexity of modern weapon systems demands that military education and instructional systems

be re-engineered to take advantage of information-age technologies. Advances in information technology support this requirement for re-engineering of the training infrastructure.

Functional Objectives

ADL supported instructional products should be designed to have the following characteristics:

- Accessibility. The ability to access instructional components from one remote location and deliver them to many other locations.

- Interoperability. The ability to use instructional components developed in one location with one set of tools or platform in another location with a different set of tools or platform (note: there are multiple levels of interoperability).

- Durability. The design of instructional components is such that it does not require redesign or re-coding to operate when base technology changes.

- Reusability. The design of instructional components is such that it can be incorporated into multiple applications.

- Adaptability. Instruction is tailorable to individual and situational needs.

- Affordability. Increase learning effectiveness significantly while reducing time and costs.

Standards

To meet DoD-wide needs there must be standards for courseware interoperability that are compatible among vendors and that do not sacrifice quality, transparency of operations, or efficiency of storage, manipulation, and management.

The following paragraphs describe the various working groups that are collaborating to create common standards, specifications and guidance in support of the ADL.

- The Institute of Electrical and Electronic Engineers (IEEE) is a non-profit, technical professional association that develops standards in areas of computer engineering, biomedical technology and telecommunications, electric power, aerospace and consumer electronics. For specific information regarding IEEE standards refer to the IEEE web site at URL http://www.standards.ieee.org.

- The Aviation Industry Computer Based Training (CBT) Committee (AICC) is an international association of technology-based training professionals that develop guidelines for aviation industry in the development, delivery, and evaluation of CBT and related training technologies. For specific information regarding the AICC refer their web site at URL http://www.aicc.org.

- The Instructional Management System (IMS) Global Learning Consortium, Inc. consortium is made up of members from educational, commercial, and government organizations

collaborating to define technical standards and specifications for interoperability of applications in distributed learning. For specific information regarding IMS specifications refer to their web site at URL http://www.imsproject.org.

• The Shareable Courseware Object Reference Model (SCORM) was developed by the ADL Technical Working Group (TWG) to detail specifications for ADLI supported products. For specific information regarding the SCORM refer to the ADL web site at URL http://www.adlnet.org.

• The International Standards Organization (ISO) establishes and promulgates standards throughout the world. ISO 9000 is a systems design standard. Z1.11 is the supplement that applies ISO 9000 in education and training settings. For specific information regarding the ISO refer to their web site at URL http://www.iso.ch.

• World Wide Web Consortium (W3C) outlines the future course of web technologies such as hypertext markup language (HTML), dynamic HTML (DHTML), standard generalized markup language (SGML) and extensible markup language (XML). For specific information regarding the W3C refer their web site at URL http://www.w3.org.

• The DoD Joint Technical Architecture (JTA) is a document that mandates the minimum set of standards and guidelines for the acquisition of all DoD systems that produce, use, or exchange information. The JTA shall be used by anyone involved in the management, development, or acquisition of new or improved information systems within DoD. For specific information regarding the JTA refer to their web site at URL http://www-jta.itsi.disa.mil.

• The Advanced Television Systems Committee (ATSC) is an international organization that is establishing voluntary technical standards for advanced television systems. ATSC digital television standards include digital high definition television (HDTV), standard definition television (SDTV), data broadcasting, multichannel surround-sound audio, and satellite direct-to-home broadcasting. For specific information regarding ATSC refer to their web site at URL http://www.atsc.org.

ADL Design

At NAVAIR an Assistant Program Manager for Training Systems (APM(TS)) is assigned to each aircraft platform. The APM(TS) is responsible for ensuring the development of an infrastructure that meets industrial and academic standards and guidelines. The APM(TS) coordinates with his team to ensure application of current computer, information, and communication technologies essential to the development of a successful ADLI supported product. The APM(TS) must ensure that the development and delivery of a successful ADLI supported product does not exclude any existing delivery method. Ideally is should expand and complement legacy delivery systems. The APM(TS), and his team, will be responsible for determining which is the optimum form of transmission for each program (such as wide area network, local area network, wide-band radio frequency (RF), or satellite capability). The ADLI team must design and develop an ADLI product that manages the information received and transmitted, and establishes an adequate infrastructure within those components (e.g., airplanes, ships, submarines, logistics centers, or others) that use it. An assessment of infrastructure requirements should be conducted to determine whether or not a user's infrastructure is considered acceptable for ADL applications.

The FMS Customer

The APM(TS) is responsible for working with the aircraft platform program office and the international programs office to determine releasibility of training data to foreign governments. The APM(TS) will also determine the appropriate cost sharing for new development where the FMS customer is a part of the team or for nonrecurring costs if the FMS customer requests to procure an already existing system. Depending on releasibility of data to each country, the APM(TS) and his team will create a web distribution system for each country employing one or more of the following methods and conditions:

- Security. The inherent design of the internet as an open free exchange of information across cyberspace poses a security risk. Techniques for ensuring that data stored in a computer cannot be read or compromised should be assessed. There are some web applications that pose some form of security threat. For instance, "push" technology (also known as web-casting or point-casting) sends information directly to a user's computer rather than forcing the machine to go and get the information. Most of today's vendors actually use a glorified "pull" system. They notify you of new information, then you have the option of whether you want to go and get it. Push technology is prohibited on all government computers because of the security risks involved. Another issue of critical concern to security is when sensitive information is being delivered over an unsecured network.

- Firewalls. A firewall acts as a shield between a user's computer or host network and the internet. Firewalls serve to protect system integrity. An installed firewall on a computer network serves two basic purposes. It controls access to the network from outside servers, and it also controls the transfer of information from the network to outside servers. Since firewalls may cause problems with importing and exporting instructional materials, managers should be aware of the firewall restrictions for their particular location and select training that can be utilized within the confines of the established firewall.

- Packet filtering. Packet filtering is a firewall configuration that involves looking at each packet of information or data entering or leaving the network and accepting or rejecting it based on user-defined rules. Limiting packet size controls the delivery of certain types of data that could also impact network. Packet filtering is fairly effective and transparent to users.

- Passwords. The main defense against people who want to break into an account is a password and keeping that password secure. A password is most secure when a random sequence of letters and other symbols is used.

- Encryption. Encryption is the translation of data into a form that is unintelligible without a deciphering mechanism (i.e., secret code). Encryption is the most effective way to achieve data security and is really nothing more than scrambling of data to make it unreadable.

- Public Key Infrastructure (PKI). A PKI is a system of digital certificates, certificate authorities, and other registration authorities that verify and authenticate the validity of each party involved in an internet transaction. It enables users of a basically unsecured public network such as the internet to securely and privately exchange data through the use of a public and a private cryptographic key pair that is obtained and shared through a trusted authority.

• Application gateway. This gateway applies security mechanisms to specific applications, such as File Transfer Protocol (FTP) and Telnet servers. This is very effective, but can impose performance degradation.

• Circuit-level gateway. This gateway applies security mechanisms when a TCP or user datagram protocol (UDP) connection is established. Once the connection has been made, packets can flow between the hosts without further checking.

Since the technology of ADL is rapidly maturing, and will be the prime source for knowledge transfer for remote training, it would be in the best interest of the FMS customer to become familiar with the national and international experts cited in this article. There are numerous symposiums at which advancements in ADL technology is announced, as well as demonstrations where the customer can test the effectiveness real-time.

About the Author

Lari Manning was born in Frankfurt, Germany and graduated from Rochester Institute of Technology in 1976 with a Bachelor of Fine Arts in graphics and in 1979 with a Masters of Science in instructional technology.

Accepted her first position in 1979 at the Maryland Vocational Curriculum Research and Development Center as a project manager and instructional designer responsible for the production of 30 multi-media courses. In 1981 she joined the Naval Education Training and Support Center, Pacific (NETSCPAC) in the Instructional Programs Development Department as an instructional designer and later as a project manager for the analysis, design, development, implementation and evaluation of twenty multi-media courses for both CNET and CNTECHTRA. In 1984 she transferred to the Naval Air Warfare Center Training Systems Division (NAWCTSD) as an instructional systems specialist. She worked at NAWCTSD in the Aviation Training Systems Division, specializing in the procurement and installation of helicopter aircrew computer based training programs. After fourteen years at NAWCTSD, Lari Manning left civil service and spent two years as a contractor performing as an instructional designer and project manager for the development of computer based training programs for commercial and military customers. She returned to the government in 1987 as a program manager at the Naval Air Systems Command, PMA205. Have spent one year at NAVAIR as an FMS assistant program manager Training Systems APM(TS) for the E-2C aircraft and a second year as the APM(TS) H-53 and VH aircraft, she was promoted in December 1999 to the integrated product team lead for CBT/ADL.